

# Homework Set # 2

## Math 303, Fall 2003

\*\*\*\*\*

This homework set is due on your second Math 303 class during the week of December 11, 2003. You must turn in your homework papers to your instructor at the beginning of the lecture.

\*\*\*\*\*

Problems are from the book "Mathematical Methods in the Physical Sciences" by M. L. Boas:

1. page 321 problems 20
2. page 327 problems 12 and 16
3. page 333 problems 5 and 9

Problems from the book "Beginning Partial Differential Equations" by P.V.O'Neil.

4. Let  $f$  be piecewise continuous on  $[0, \pi]$ . Show that

$$\frac{1}{2}a_0^2 + \sum_{n=1}^{\infty} a_n^2 \leq \frac{2}{\pi} \int_0^{\pi} f^2(x) dx,$$

in which  $a_n$ 's are the coefficients in the Fourier cosine expansion of  $f$ .

5. Prove that

$$F[e^{ikx} f](\omega) = \hat{f}(\omega - k),$$

where  $F[f] = \hat{f}$  is the Fourier transform of  $f$ .

6. Show that if the function  $f(x)$  is differentiable on the interval  $[-L, L]$  then its Fourier coefficients are tending to zero, when  $n \rightarrow \infty$ .